University of Hawaii at Manoa

Hawaii Natural Energy Institute
Holmes Hall 246 • 2540 Dole Street • Honolulu, Hawaii 96822

August 15, 1990

Mr. Duane Kanuha
Director
Planning Department
County of Hawaii
25 Aupuni Street
Hilo, Hawaii 96720

Dear Mr. Kanuha:

As required in the County of Hawaii Planning Commission's geothermal resources permit (GRP 89-1), we have enclosed five (5) copies each of the July monthly report.

If you have any questions, please call me at 522-5620.

Sincerely yours,

Harry Olson
Hawaiian Electric Industries/
Spark Matsunaga Fellow in Geothermal
Energy Research

Enclosure: July monthly report

JULY 1990 MONTHLY REPORT

Scientific Observation Hole (SOH) Program

Geothermal Resource Permit: GRP 89-1

Lilewa, Kapoho, and Halekamahina, Hawaii

TMK: 1-2-10:01; 1-4-01:02; and 1-4-02:32

Hawaii Natural Energy Institute

University of Hawaii

August 1990

SUMMARY

This document presents a monthly report to the County of Hawaii Planning Department to support the scientific observation hole (SOHs) program in the Kilauea middle and lower east rift zone. The SOHs are for scientific observation purposes only. The holes will not be flow-tested or produced. The information to be gained from the SOHs will provide an assessment of subsurface geological conditions, groundwater level and composition, temperature, drilling conditions, an inventory of possible mineral and geothermal resources, and an eruptive history of the island to the depth drilled.

This report addresses: occurrence and duration of any start-up, shut-down, and operation mode of any SOH/facility; performance testing, evaluation, calibration checks, and adjustment and maintenance of the continuous emission monitor(s) that have been installed; and emission measurements.

I. INTRODUCTION

The County of Hawaii Planning Commission approved, on August 8, 1989, a geothermal resource permit application (GRP 89-1) to drill scientific observation holes (SOHs) in the Kilauea middle and lower east rift zone. This document presents a monthly report, as required in condition 6:

> "The petitioner shall maintain a record in a permanent form suitable for inspection and five (5) copies shall be filed with the Planning Department on a monthly basis during drilling and for six (6) months after the completion of drilling to establish a hole specific baseline and such record shall be available to the community. The record shall include:
>
> a. Occurrence and duration of any start-up, shut-down, and operation mode of any SOH/facility.
>
> b. Performance testing, evaluation, calibration checks, and adjustment and maintenance of the continuous emission monitor(s) that have been installed.
>
> c. Emission measurements reported in units compatible with applicable standards/guidelines."

II. BACKGROUND

The SOHs are for scientific observation purposes only. The holes <u>will not be flow-tested or produced</u>. As designated, four holes are planned on the Big Island of Hawaii. Three of the Big Island holes (SOHs 1, 2, and 4) are on agriculture land and have been permitted by the County of Hawaii Planning Commission. The fourth hole, designated SOH 3, is on conservation land. SOH

activities under Conservation District Use Permit (HA 12/20/85 - 1830) issued to the Estate of James Campbell has been approved.

III. SOH 4 SITE

Drilling Activity

Drilling completed -- no activity for this period.

Monitoring Program - Air Quality

Drilling completed -- no activity for this monitoring program.

Monitoring Program - Meteorological

Drilling completed -- no activity for this monitoring program.

Monitoring Program - Noise

Drilling completed -- no activity for this monitoring program.

Emissions Reports

Drilling completed -- no activity for this monitoring program.

IV. SOH 1 SITE

Drilling Activity

Tonto drilling services continued drilling activities to a depth of 1998 feet. Seven-inch casing was set and cemented to 1996 feet, and the blowout preventer equipment tested on July 30, 1990. Drilling was suspended from July 8 - 11, 1990, due to drive train failure on the drill rig.

Monitoring Program - Air Quality

The air quality monitoring station provides a continuous record of atmospheric H_2S concentrations when interfaced with a data logger or chart recorder. The unit is located in a utility container on-site and power is provided by the drill rig system.

Power failure and instrumentation problems were the causes for loss data during this period. Total data capture was 88 percent (see Appendix for details).

Monitoring Program - Meteorological

Continuous wind speed and direction measurements will be made with a recording wind speed/direction sensor system. A data logger and back-up pressure-sensitive recorder is being used to record the wind speed and direction data. The unit is located in a utility container on-site, and power is provided by the drill rig system.

About 36 hours of loss data occurred during this period. The causes of this loss is unknown at this time, since it does not coincide with drill rig down times. However, total data capture was about 94 percent (see Appendix for details).

Monitoring Program - Noise

One noise monitoring station is located at the SOH 1 site during drilling. A second noise station is located at the Laughlin residence, about a quarter mile west of SOH 1 drill site. These systems operated near maximum

efficiency during this period.

With landowners permission, a third noise monitoring station is scheduled to be installed at the Pommerenk's residence, about a mile east of the SOH 1 site (see Appendix for details).

Emissions Reports

H_2S monitor is located on-site. The average H_2S level measured is about 2 ppb. The Colortek sensors show no indication of any emissions from the well.

V. SOH 3 SITE

No drilling activity was conducted at the site. Preliminary work for drill site access has been initiated. Siting of SOH 3 will be determined soon.

VI. SOH 2 SITE

No drilling activity has been initiated. Ambient noise monitoring is being prepared for SOH 2 site. Findings of the flora/fauna field surveys were submitted to County of Hawaii Planning Department. Permit application was approved by Department of Land and Natural Resources to inspect, modify, and if practical install a pump into existing airstrip well to supply water for drilling operations.

A grading and grubbing permit application has been submitted to the County of Hawaii Planning Department.

APPENDIX

MAINTENANCE REPORT

ALPHA MICROSYSTEMS

1550 Akolea Place
Hilo, Hawaii 96720
(808) 935-7985

HAWAII NATURAL ENERGY INSTITUTE
2540 Dole Street
Honolulu, HI 96822

Attn Arthur S. Seki

August 6, 1990

Dear Art,

This report covers the period Jul. 1, to Jul. 31, 1990.

GILMAN HAI. There was a 23 hour data loss on July 24-25 that was probably caused by a power outage at this residence only. I became aware of the problem only when I reduced the data for this period. There was also a power outage on July 29-31 which caused an additional 53 hours data loss. Except for these losses the station operated normally. Calibrations were routine. Total data capture for the month was 90%.

SOH-1 HAI. There was a 63 hour data loss on July 8-10 due to a Drill-Rig breakdown. There was also a 3 hour data loss on July 27, probably due to power shutdown. An additional 24 hour data loss on July 29-30 was not discovered until data reduction for that period was performed. No power is believed to be the cause. There was a sample-pump problem on July 23, but field repair enabled the analyzer to continue operation until the 25th, when the pump assembly was replaced. There was no effect on the data. Total data capture was 88%.

WOODS HAI. This instrument operated normally during the entire month. There were no problems or data losses. Calibrations were very stable and collected data seemed normal. Total data capture was 100%.

WOODS MET. There was a data loss of 19 hours on July 15-16. The chart-recorder brake failed, allowing the chart paper to run free to the end of the spool. There were also problems with the multiplexer at the early part of the month, but was able to resolve that problem within a few days. The right channel of the chart recorder began giving trouble on July 25 by imprinting weak traces. I was able to make repairs to the impact needle of the meter-movement that are satisfactory for the time being, but may have to replace the meter in the near future. Total data capture was 97%.

T.P. MET. There was a two hour data loss on July 27 due to chart paper running out. There were no other losses or problems with the station during July. All calibrations were routine, and no adjustments were necessary. Data capture was 97%.

SOH-1 MET. There were 38 total hours of data loss at this instrument on July 8-9. The hours of loss do not completely agree with the losses during that same period at the H2S analyzer. I cannot account for that difference. There was also a loss of 8 hours on July 26 which also does not aggree with the loss at the H2S analyzer. Actual instrument and chart recorder operation was normal with those exceptions. Total data capture for July was 94%.

SOH-4 COLORTEK. These cards were routinely replaced and did not give any indications of color change.

Enclosed:

H2S Data Reduction for Gilman, SOH-4 and Woods Stations for July 1990.
Average, Maximum and total H2S for the above stations.

Meteorological Data Reduction for Woods, T.P., and SOH-1. July 1990.

Synopsis of Woods and T.P. Met Data for July, 1990.

Copy of Station Logs, July, 1990.

August Invoice

J-183 Monday 7-2-90

Woods HAI — Range 0 - 2 ppb

Flow Steady @ 3.0, Replaced head Acetate - Renewed Chart
Drained Tygon - Filled Bubbler - Cleaned Sample Chamber.
Check 23.2%, down .8%
Optics 1560-1570, up 10-, adj to 1570-1570
Range - High Li Low Li
Zero Calib 22 9 3 1 (zero Pot 1/8 left) 0
Span Calib Exp 50 50 50 50 (span Pot 1/2 left) 50
Act 33 45 50 52 50

Woods Met

Multiplexer Flaky - May need Fact. Repair - Renewed Chart

T.P. Met

Operating Normally - Renewed Chart, Batt 12.38

SO2-1 Met

Operating Normally - Renewed Chart

Gilman HAI — Range 0 - 2 ppb

Flow steady @ 3.0, Renewed Chart, Replaced head Acetate
Tygon Dry - Pump + Bubbler O.K
Check Steady @ 19.7%
Optics 1910-1890, down 20-, adj To 1890-1890
Range - High Li Low Li
Zero Calib 18 4 0 0

SO2-1 HAI — Range 0 - 2 ppb

Flow Steady @ 3.0, Renewed Chart, lead Acetate O.K
Tygon Dry - Pump + Bubbler O.K
Check Steady @ 20.9%
Optics Steady @ 1840-1840
Range - High Li Low Li
Zero Calib 19 6 1 0

NAME EXPERIMENT NO.

J-187, Friday 7-6-90

Woods NAI Range Ø-3 ppb
Flow steady @ 3.0, Replaced Chart, Lead Acetate OK
Drained Tygon - Pump + Bubbler OK
Check 23.1%, down .1%
Optics Steady @ 1570-1570
Range - High Lil Low Lil
Zero Calib 23 1 Ø 1 Ø

Woods Met
Operating Normally - Re-aligned Mux switch - Renewed Chart
T.P. Met
Operating Normally - Chart + Batt OK
SOH-1 Met
Operating Normally - Renewed Chart, Re Calibrated W.S. Sensor

Gilmon NAI Range Ø-3 ppb
Flow steady @ 3.0, Chart + Lead Acetate OK
Tygon Dry - Pump + Bubbler OK
Check Steady @ 19.7%
Optics Steady @ 1900-1900
Range - High Lil Low Lil
Zero Calib 19 9 2 Ø Ø
Span Calib - Exp 50 50 50 50 50
Act 29 41 49 49 50
} No adj. Necessary

SOH-1 NAI Range Ø-2 ppb
Flow steady @ 3.0 Chart + Lead Acetate OK
Tygon Dry - Pump + Bubbler OK
Check 21.3%, up .4%
Optics 1860-1870, up 10 ea, adj to 1870-1870
Range - High Lil Low Lil
Zero Calib 19 1 2 1 Ø

J-190 Monday 7-9-90

Woods HAI — Range 0-3ppb

Flow Steady @ 3.0, Chart + Lead Acetate OK
Tygon Dry - Filled Bubbler - Pump O.K
Check 23.0%, down .1%
Optics Steady @ 1560-1560
Range- High 1:1 Low 1:1
Zero Calib 20 4 1 0

Woods Met

Operating Normally - Chart + Rain Gage O.K

T.P. Met

Operating Normally - Chart + Batt. O.K

SOH-1 Met

Inoperative - No Power - Rig Break Down 0900, 7-8-90

Gilman HAI — Range 0-3ppb

Flow Steady @ 3.0, Chart + Lead Acetate O.K
Tygon Dry - Pump + Bubbler O.K
Check Steady @ 19.7%
Optics 1900-1880, down 20 ea, adj to 1880-1880
Range- High 1:1 Low 1:1
Zero Calib 18 6 3 1 0

SOH-1 HAI — Range 0-2ppb

Inoperative since 0900, 7-8-90 due to Rig Breakdown - No Power - Awaiting Parts.
Checked instrument - Ready to Go when power is restored

J-192 Wednesday 7-11-90

Woods NAI Range ϕ-3ppb
Flow steady @ 3.0, Renewed Chart, lead Acetate O.K
Tygon Dry - Filtrd Bubbler - Pump O.K
Check Steady @ 23.0%
Optics 1570-1560, down 10 ea, No adj.
Range - High Lil Low Lil
Zero Calib 21 6 2 ϕ ϕ

Woods Met
Operating Normally - ~~Renewed~~ Chart O.K.

TP Met
Operating Normally - Renewed Chart - Batt 12.2 V

SOH-1 Met
Operating Normally - Chart O.K

Gilman NAI Range ϕ-3ppb
Flow Steady @ 3.0, Renewed Chart, lead Acetate O.K
Tygon Dry - Pump + Bubbler O.K
Check Steady @ 19.7%
Optics 1880-1910, up 30 ea, adj to 1910-1910
Range - High Lil Low Lil
Zero Calib 6 9 3 1 ϕ

SOH-1 NAI Range ϕ-3
Flow Steady @ 3.0, Renewed Chart - lead Acetate O.K
Tygon Dry - Pump + Bubbler O.K
Check 20.8%, down .5%
Optics 1800-1770, down 30 ea, adj to 1770-1770
Range - High Lil Low Lil
Zero Calib 18 4 3 1 ϕ
Span Calib - Exp 50 50 50 50 (span Pot 3/8 Right) 50
ACT 33 45 47 48 50

J-194 Friday 7-13-90

Woods HAI — Range Ø - 3ppb

Flow Adj to 3.0, chart + Lead Acetate O.K
Tygon Dry - Pump + Bubbler O.K
Check Steady @ 23.0%
Optics 1570-1560, down 10 ~, No Adj
Range High Li Low Li
Zero Calib 4 20 4 10
Span Calib - Exp 50 50 50 50
Act 37 42 48 50

Woods Met

Operating Normally - Renewed Chart

TR Met

Operating Normally - Chart + Batt O.K

SOD-1 Met

Operating Normally - Chart Renewed

Gilmm HAI — Range Ø - 2ppb

Flow steady @ 3.0, chart + lead Acetate O.K
Tygon Dry - filter Bubbler - Pump O.K
Check Adjusted to 24.2%
Optics 1800-40, up 40 ~, adj to 1840-1840
Range - High Li Low 1ppb Low - adj for Li
Zero Calib 22 4 2 10

SOD-1 MAI — Range Ø - 2ppb

Flow steady @ 3.0, chart + Lead Acetate O.K
Tygon Dry - Pump + Bubbler O.K
Check Steady @ 19.7%
Optics 1910-1920, up 10 ~, adj to 1920-1920
Range - High Li Low Li
Zero Calib 19 4 3 10

J-197 Monday 7-16-90

Woods HAI — Range 0 - 3 ppb
Flow Steady @ 3.0, Chart OK - Replaced Lead Acetate
Drained Tygon - Cleaned Sample Chamb - Pump OK
Check 22.9%, down .1%
Optics 1570-1560, down 10 ~~adj to 15~~ No Adj.
Range: High Lil Low Lil
Zero Calib 21 4 2 0

Woods Met
Chart Ran Out - Lost some Data - Replaced Chart.
T.P. Met
Operating Normally - Chart OK
SOH-1 Met
Operating Normally - Chart OK

Gilman HAI — Range 0 - 2 ppb
Flow Steady @ 3.0, chart OK - Replaced Lead Acetate
Tygon Dry - Cleaned Sample Chamb.
Check 19.2%, down .5%
Optics 1930-1900, down 30 ~, adj To 1930-1930
Range: High Lil Low Lil
Zero Calib 18 6 2 0
Span Calib - Exp 50 50 50 50 (Span Pot 1/2 Right) 50
Act 22 37 46 48 50

SOH-1 HAI — Range 0 - 2 ppb
Flow Steady @ 3.0, Chart OK - Replaced Lead Acetate
Tygon Dry - Cleaned Sample Chamb - Pump OK
Check 23.9%, down .3%
Optics Steady @ 1840-1840
Range High Lil Low 1 ppb High, adj Span Lil
Zero Calib 22 9 3 1 0

J-199 Wednesday 7-18-90

Woods HAI — Range 0-3 ppb

Flow Steady @ 3.0, Renewed Chart, Lead Acetate O.K
Drained Tygon - Filled Bubbler - Pump O.K
Check 23.1%, up .2%
Optics 1570-1580, up 10 ea, adj to 1580-1580
Range High Lil Low Lil
Zero Calib 22 9 3 0

Woods Met

Operating Normally - Renewed Chart, Ran Edge O.K

TP Met

Operating Normally - Renewed Chart - Batt 12.1 V

SOH-1 Met

Operating Normally - Renewed Chart

Gilman HAI — Range 0-3 ppb

Flow Steady @ 3.0 Renewed Chart, Lead Acetate O.K
Drained Tygon - Filled Bubbler - Pumps O.K
Check 19.7%, up .5%
Optics 1920-1890, down 30 ea, Adj to 1900-1900
Range - High Lil Low Lil
Zero Calib 19 6 3 1 0

SOHI HAI — Range 0-2 ppb

Flow Steady @ 3.0, Renewed Chart, Lead Acetate O.K
Tygon Dry - Filled Bubbler - Pump O.K
Check 24.0%, up .1%
Optics 1850-1860, up 10 ea, adj to 1860-1860
Range - High Lil Low Lil
Zero Calib 22 4 4 0
Span Calib - Exp 50 50 50 50
Act 35 46 50 50
} No Adj Required

J-204 Monday 7-23-90

Woods HAI — Range 0 - 2 ppb

Flow steady @ 3.0, chart + lead Acetate OK
Tygon Dry - Pump + Bubbler OK
Check 23.6%, up -5%
Optics 1580-1590, up 10 ea, adj to 1540-1590
Range - High 1:1 Low 1ppb Low, adj for 1:1
Zero Calib 23 11 2 -0 (Zero Pot Fell Right) 0
Span Calib - Exp 50 50 50 50
Act 24 39 47 50

Woods Met
Operating Normally - Renewed Chart

J.B. Met
Operating Normally - Renewed Chart - Batt O.K. @ 12.57

SOH-1 Met
Operating Normally - Chart OK

Elmwn HAI — Range 0 - 2 ppb
Flow steady @ 3.0, Replaced Chart, lead Acetate OK
Tygon Dry - Filled Bubbler - Pump O.K
Check steady @ 19.7%
Optics Steady @ 1910-1910
Range - High 1:1 Low 1:1
Zero Calib 18 4 1 1 0

SOH-1 MAI — Range 0 - 2 ppb
* Flow very weak, Chart + lead Acetate OK
Tygon Dry - Will Have to Replace Pump - unable to Ex.
Check 24.2%, up .2%
Optics 1870-1880, up 10 ea, adj to 1880-1880
Range - High 1:1 Low 1:1
Zero Calib 23 9 2 0

J-206 Wednesday 7-25-90

Woods HAI — Range 0 - 3 ppb

Flow Steady @ 3.0, Renewed Chart, Lead Acetate O.K

Tygon Dry - Filled Bubbler - Pump O.K

Check 23.3%, down .3%

Optics Steady @ 1590-1590

Range - High 1:1 Low 1:1

Zero Calib 24 4 0 0

Woods Met

* Right Channel O.K Chart Recorder intermittant - Believe Meter Movement Going bad - Made adjustments, but may have to Replace Meter - Chart + Roll Gage O.K

T.P. Met

Operating Normally - chart + Batt O.K

SO H-1 Met

Operating Normally - Renewed Chart.

Gilman HAI — Range 0 - 2 ppb

Flow Steady @ 3.0, Renewed Chart, Lead Acetate O.K

Tygon Dry - Pump + Bubbler O.K

Check Steady @ 19.7%

Optics Steady @ 1920-1920

Range - High 1:1 Low 1:1

Zero Calib 19 7 3 0

SO H-1 ~~Met~~ HAI — Range 0-2 ppb

* Flow very weak + Unstable - Replaced Pump with rebuilt unit - Renewed Chart, Lead Acetate O.K

Tygon Dry - filled Bubbler - Set Flow to 3.0

Check 24.1%, down .1%

Optics Steady @ 1880-1880

Range High 1:1 Low 1:1

Zero Calib 22 4 3 1 0

J-208 Friday 7-27-90

Woods HAI — Range 0 – 3 ppb

Flow steady @ 3.0, Replaced Chart, Lead Acetate O.K
Tygon Dry - Pump + Bubbler OK
Check Steady @ 23.3%
Optics 1600-1580, down 20 ct, adj To 1590-1590
Range High 1:1 Low 1:1
Zero Calib 20 5 1 0 0

Woods Met

Operating Normally again - Renewed Chart

J.B. Met

Operating Normally - Replaced Chart - Replaced Batt 12.89 for 12.0

SOH-1 Met

Operating Normally - Chart O.K.

Gilmon HAI — Range 0 – 3 ppb

Flow steady @ 3.0, chart + Lead Acetate O.K
Tygon Dry - Pump + Bubbler OK
Check 20.2%, up .5%
Optics 1910 - 1920, up 10 ct, adj To 1920-1920
Range High 1:1 Low 1:1
Zero Calib 18 8 2 1 0

SOH-1 HAI — Range 0 – 3 ppb

Flow steady @ 3.0, chart + Lead Acetate O.K
Tygon Dry - Pump + Bubbler O.K
Check Steady @ 24.1%
Optics 1850 - 1840, down 10 ct, No adjustment
Range High 1:1 Low 1:1
Zero Calib 22 8 1 0
Span Calib - Exp 50 50 50 50 (span Pot) 50
Act 32 45 48 49 (% Right) 51

Colortec

Replaced all Colortec cards - No Visible Color Change

J-211 Monday 7-30-90

Woods HAI — Range 0 – 3 ppb

Flow Steady @ 3.0, Chart O.K. - Replaced Lead Acetate
Drained Typoon - Filled Bubbler - Cleaned Sample Chamb.
Check Steady @ 23.3°
Optics Steady @ 1600-1600
Range- High 1:1 Low 1:1
Zero Calib 23 4 10 0
Span Calib - Exp 50 50 50 50 50
Act 29 39 46 49 50

Woods Met

Operating Normally but Right Channel Flakey - Chart O.K

T.P. Met

Operating Normally - Chart + Both O.K.

SOH-1 Met

Operating Normally - Chart O.K.

Gilman HAI — Range 0 – 2 ppb

Power OFF at Time of Station Check (0945)
Unable to fully Test instrument
Replaced Lead Acetate - Chart O.K

SOH-1 HAI — Range 0 – 3 ppb

Flow Steady @ 3.0, Replaced Chart - Replaced Lead Acetate
Drained Typoon - Cleaned Sample Chamb - Pump O.K
Check Steady @ 24.1°
Optics 1850-1620, down 30 ea, Adj to 1840-1840
Range- High 1:1 Low 1:1
Zero Calib 23 5 3 0

* Note: Power was off for a short Time - Rig Repair (0900)

STATION LOG

J-183 Monday 7-2-90

SOH-1 0810 Clouds 100%,rain WS&DIR 290 @ 2-3
Chart was jammed due to a paper feed problem. Some data was lost. Pen & chart reserve O.K.

LOUGHLIN 0852 Clouds 100%,rain WS&DIR 300 @ 2-3
Station operating normally. No problems

J-187 Friday 7-6-90

SOH-1 0800 Clouds 10% WS&DIR 330 @ 4-6
Operating normally. Recalibrated sound meter to 110.0 from 100.1. Recalibrated recorder up 2 db.

LOUGHLIN 0855 Clouds 20% WS&DIR 330 @ 4-5
Pen ran dry. Some data lost. Replaced pen, checked meter calibration..No adjustment required for either meter or recorder.

J-190 Monday 7-9-90

SOH-1
Station inoperative due to drill-rig breakdown at 0900, yesterday. Awaiting parts for rig, unknown arrival.

LOUGHLIN 0835 Clouds 90% WS&DIR 310 @ 2-3
Operating normally. No adjustments necessary.

J-192 Wednesday 7-11-90

SOH-1 0820 Clouds 40% WS&DIR 325 @ 4-5
Drill-Rig back in operation as of 0000 AM today. Station operating normally, no problems.

LOUGHLIN 0840 Clouds 50% WS&DIR 330 @ 4-5
Operating normally. Chart reserve & Pen O.K.

NOTE Received 6 boxes of chart paper from Esterline-Angus

J-194 Friday 7-13-90

SOH-1 0810 Clouds 60% WS&DIR 290 @ 4-6
Station operating normally. Recalibrated Sound Meter to 110.0 from 110.2. Nc adjustments to Recorder. Chart reserve and Pen O.K.

LOUGHLIN 0950 Clouds 100%,rain WS&DIR 300 @ 3-4
Station operating normally. Recalibrated Sound Meter to 110.0 from 110.2. No adjustments to Recorder. Chart reserve & Pen O.K.

J-197 Monday 6-16-90

SOH-1 0820 Clouds 100%, rain WS&DIR 335 @ 4-6
Station operating normally. Renewed chart.

LOUGHLIN 0845 Clouds 100%, rain WS&DIR 330 @ 5-6
Station operating normally. Renewed chart and replaced pen.

J-199 Wednesday 7-18-90

SOH-1 0822 Clouds 100%, rain WS&DIR 80 @ 3-4

Operating normally. No problems.

LOUGHLIN 0832 Clouds 100%, rain WS&DIR 60 @ 2-3

Operating normally. No problems.

J-204 Monday, 7-23-90

SOH-1 0809 Clouds 75% WS&DIR 300 @ 3-4

Chart pen intermittant...Skips in data recording. Some data was lost.Replaced pen, Chart reserve O.K. Checked Meter calibration. No adjustment necessary. Chart recorder was adjusted higher by 2 db.

LOUGHLIN 0853 Clouds 25% WS&DIR 15 @ 5-7

Operating normally. Chart reserve and Pen O.K. Re-calibrated Meter to 110.0 from 109.8. No adjustment to recorder.

J-206 Wednesday, 7-25-90

SOH-1 0823 Clouds 90%, rain WS&DIR 350 @ 4-5

Station operating normally

LOUGHLIN 0900 Clouds 90% WS&DIR 240 @ 3-4

Operating normally. Adjusted recorder down 2db.

J-208 Friday, 7-27-90

SOH-1 0807 Clouds 95%, rain WS&DIR 100 @ 4-6

Operating normally. Calibrated sound meter to 110.0 from 109.8. No adjustments required for recorder.

LOUGHLIN 0855 Clouds 90% WS&DIR 125 @ 3-5

Operating normally. Calibrated sound meter to 110.0 from 109.9. No adjustments required for recorder.

J-211 Monday, 7-30-90

SOH-1 0800 Clouds 90%, rain WS&DIR 330 @ 2-3

Rig was shut down briefly for repairs. Checked station again when operation resumed. Normal...Replaced Pen.

LOUGHLIN 0915 Clouds 95% WS&DIR 315 @ 0-2

Station operating normally. Replaced chart.

J-213 Wednesday, 8-1-90

SOH-1 0809 Clouds 95% WS&DIR 360 @ Calm

Operating normally. Renewed chart.

LOUGHLIN 0850 Clouds 100%, rain WS&DIR 320 @ 2-3

Pen ran dry. Replaced. Renewed chart.

SPECIAL

Received new Sound Meter and Chart Recorder from Quest. Unpacked, assembled, tested and installed on test bench for run-in, check-out and initial calibration.

DAILY AVERAGE, MAXIMUM AND TOTAL H2S READINGS

July 1 To July 31, 1990

	Gilman			SOH-1			Woods					
ate	Avg	Max	Total	Avg	Max	Total	Avg	Max	Total	Avg	Max	Total
701	1	2	26	2	3	44	2	3	43			
702	1	2	34	2	2	46	1	3	32			
703	2	3	37	2	2	41	1	2	20			
704	2	3	39	2	2	36	1	3	31			
705	1	3	34	1	2	34	1	3	27			
706	2	3	37	1	2	30	1	2	24			
707	2	4	38	1	2	31	2	3	37			
708	1	3	32	1	2	12	2	3	47			
709	1	2	33	-	-	-	2	2	37			
710	1	2	35	-	-	-	2	2	42			
711	2	3	38	2	3	48	1	2	29			
712	2	3	39	2	3	44	2	2	38			
713	2	3	42	2	2	37	2	3	39			
714	1	3	34	2	3	45	1	3	34			
715	1	2	18	2	2	41	2	2	39			
716	2	3	36	2	3	38	1	3	28			
717	2	3	46	2	3	38	1	2	26			
718	2	2	38	1	2	31	1	2	18			
719	2	3	43	1	2	19	1	2	24			
720	2	3	42	2	2	36	1	2	23			
721	1	3	34	1	2	31	1	2	23			
722	1	3	34	1	2	23	1	2	19			
723	1	2	32	1	2	21	1	2	30			
724	1	2	18	1	2	21	2	3	38			
725	1	2	31	1	2	30	1	2	31			
726	2	3	36	2	3	45	1	3	35			
727	2	2	36	1	3	35	1	2	30			
728	2	3	39	2	2	39	1	2	34			
729	0	2	7	0	2	7	2	3	42			
730	-	-	-	1	3	28	1	2	28			
731	1	3	14	2	3	40	1	3	32			
	2	4	994	2	3	974	1	3	980			

l readings are in parts per billion (ppb)

H2S CHART REDUCTION -- SOH-1 Station

From 7-1-90 to 7-31-90

HOUR:	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Avg	Max	Total
0701	1	2	1	1	2	2	2	2	3	2	2	2	1	1	2	2	2	2	2	2	2	2	2	2	2	3	44
0702	2	2	2	2	2	2	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	46
0703	2	2	2	2	2	2	2	2	2	1	1	1	1	2	1	1	1	2	2	2	2	2	2	2	2	2	41
0704	2	2	1	2	2	2	2	1	1	1	2	2	2	2	2	2	2	2	1	1	0	0	1	1	2	2	36
0705	1	1	1	2	2	2	2	2	2	1	0	1	1	2	2	1	2	2	1	1	1	1	2	1	1	2	34
0706	1	2	2	2	2	1	0	1	0	1	2	1	2	1	0	1	2	2	2	1	1	1	1	1	1	2	30
0707	2	1	2	2	1	1	1	0	1	1	2	2	1	2	2	2	1	2	2	1	1	0	0	1	1	2	31
0708	1	1	1	1	1	2	2	1	2	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	1	2	12
0709	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	0	0	0
0710	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	0	0	0
0711	2	1	1	2	2	2	3	2	2	2	2	2	2	2	2	2	3	2	2	2	2	2	2	2	2	3	48
0712	2	2	2	2	2	2	2	3	2	2	2	2	2	2	2	2	1	1	1	1	2	2	1	2	2	3	44
0713	1	2	1	1	1	2	2	2	2	1	2	1	1	1	1	1	2	2	2	1	2	2	2	2	2	2	37
0714	2	2	2	2	2	2	1	2	1	3	2	2	2	2	3	3	2	1	2	1	1	2	1	2	2	3	45
0715	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	2	2	2	41
0716	2	2	2	2	2	2	2	1	2	3	2	2	1	1	2	1	2	2	2	1	1	1	0	0	2	3	38
0717	1	1	1	1	1	1	1	1	2	2	3	2	2	2	2	2	2	2	2	2	2	1	1	1	2	3	38
0718	2	2	2	2	1	2	2	1	2	‡	2	1	1	1	1	1	2	1	1	1	1	1	1	0	1	2	31
0719	0	1	1	0	1	0	1	1	1	1	1	1	1	2	2	1	0	0	0	0	1	1	1	1	1	2	19
0720	1	1	1	0	1	1	1	2	1	2	2	2	2	1	2	2	2	1	2	2	2	1	2	2	2	2	36
0721	1	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	2	2	2	1	1	2	1	1	1	2	31
0722	1	1	1	0	0	1	2	1	1	1	1	1	1	1	2	1	1	1	0	1	1	1	1	1	1	2	23
0723	1	1	0	1	1	0	1	0	2	2	1	1	1	2	2	1	1	0	0	0	0	1	1	1	1	2	21
0724	1	0	1	0	0	2	1	1	1	1	2	2	1	1	1	2	2	1	0	0	0	0	0	1	1	2	21
0725	1	1	0	0	0	0	0	1	2	1	2	2	1	1	1	1	2	2	2	2	2	2	2	2	1	2	30
0726	1	2	2	2	2	2	2	3	1	2	2	2	2	1	2	1	2	2	2	2	2	2	2	2	2	3	45
0727	2	2	1	1	1	1	‡‡	‡‡	‡‡	‡	2	3	2	1	2	2	2	2	2	2	2	2	2	1	1	3	35
0728	2	2	2	1	1	0	1	1	2	1	1	2	2	2	2	2	2	2	2	2	2	2	1	2	2	2	39
0729	1	2	2	1	1	1	1	1	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	0	2	10
0730	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	‡‡	2	2	1	3	2	2	2	2	2	2	2	2	2	1	1	1	3	28
0731	1	1	1	1	1	2	1	1	2	1	2	2	2	2	3	2	2	2	3	3	2	1	1	1	2	3	40
																											974
AVG.	1	1	1	1	1	1	1	1	1	1	2	1	1	1	2	1	2	1	1	1	1	1	1	1	2		
MAX.	2	2	2	2	2	2	3	3	3	3	3	3	3	2	3	3	3	2	3	3	2	2	2	2		3	

‡‡=Power or Equip. failure: ‡=Calibration

Synopsis of Average Daily Meterological Station Readings

07/1989

	T. P. MET					WOODS MET						
DAY	TEMP	WD	WS	RAIN	RH	TEMP	WD	WS	RAD	RAIN	RH	SIGMA
01	22.9	325	7.3	0.14	-	23.4	332	5.1	156	0.17	-	47.6
02	23.2	349	5.7	0.29	-	23.7	4	4.6	160	0.34	-	49.2
03	23.3	7	7.0	0.00	-	24.0	9	4.1	222	0.10	-	57.1
04	22.2	320	6.1	0.03	-	23.1	337	3.5	212	0.04	-	49.4
05	22.3	324	5.9	0.21	-	22.9	357	4.1	242	0.23	-	40.5
06	22.1	311	5.7	0.01	-	22.8	322	3.5	222	0.00	-	42.3
07	22.2	328	5.7	0.11	-	22.8	345	2.9	210	0.16	-	41.9
08	21.8	355	6.3	0.68	-	23.0	6	4.4	110	0.77	-	32.4
09	22.9	328	5.2	0.23	-	23.8	355	3.2	218	0.11	-	38.3
10	22.4	329	5.4	0.27	-	23.6	11	3.5	200	0.34	-	45.4
11	22.8	338	5.3	0.09	-	23.5	342	3.2	216	0.08	-	50.4
12	22.2	331	4.7	0.42	-	22.7	19	2.8	106	0.26	-	44.5
13	22.5	322	5.1	0.14	-	23.1	349	3.3	208	0.14	-	40.0
14	22.9	352	6.2	0.02	-	23.8	359	2.8	202	0.04	-	45.0
15	22.8	336	4.8	0.13	-	23.3	318	2.4	82	0.16	-	39.7
16	21.7	298	6.6	0.29	-	24.1	325	3.8	124	0.34	-	45.2
17	22.6	309	6.2	0.20	-	24.0	300	4.5	194	0.23	-	35.9
18	22.5	3	5.5	0.55	-	23.6	335	3.1	110	0.22	-	43.3
19	22.2	334	5.4	0.96	-	23.0	361	3.5	100	1.20	-	30.0
20	22.4	334	5.5	0.09	-	23.4	335	3.2	120	0.10	-	36.1
21	22.5	307	4.0	0.71	-	23.5	327	2.3	124	0.71	-	35.9
22	22.5	329	5.3	0.07	-	23.1	356	4.5	150	0.07	-	31.1
23	23.1	328	5.6	0.04	-	23.8	355	3.5	216	0.06	-	39.5
24	23.0	353	6.8	0.21	-	23.3	338	4.4	164	0.14	-	44.9
25	23.2	344	6.8	0.06	-	23.7	322	4.5	196	0.10	-	42.1
26	23.3	315	6.7	0.04	-	23.7	342	3.7	188	0.02	-	35.4
27	24.0	355	6.2	0.21	-	24.3	313	2.9	142	0.16	-	45.4
28	23.4	346	6.0	0.24	-	23.5	31	2.8	122	0.10	-	41.9
29	24.8	7	5.8	0.01	-	25.2	65	2.9	220	0.02	-	51.7
30	24.0	358	5.5	0.24	-	24.3	50	2.9	128	0.20	-	40.6
31	23.8	346	5.8	0.13	-	24.1	31	2.7	132	0.10	-	40.6
AVG	22.8	336	5.8	0.22	0	23.5	351	3.5	168	0.22	0	42.0
MAX	24.8	-	7.3	0.96		25.2	-	5.1	242	1.20		57.1
MIN	21.7	-	4.0	0.00	1000	22.7	-	2.3	82	0.00	1000	30.0
TOT				6.82					5196	6.71		

Meteorology Station Log
SOH-4
7-1-90 to 7-31-90

Time	W/D	W/S	W/D	W/S	W/D	W/S	W/D	W/S
	0701		0702		0703		0704	
0000	335	5	295	4	15	4	335	4
0100	320	4	290	3	5	4	340	5
0200	315	3	300	2	360	4	345	4
0300	345	6	320	4	10	5	350	3
0400	325	4	15	6	25	4	325	3
0500	320	3	10	5	20	4	355	4
0600	295	3	10	4	20	3	300	3
0700	285	3	350	3	15	4	290	3
0800	290	4	285	4	30	7	280	4
0900	295	3	310	6	35	9	305	4
1000	360	8	345	7	30	9	320	5
1100	355	8	10	8	35	9	325	6
1200	350	7	25	9	35	8	5	8
1300	15	10	20	10	40	8	15	8
1400	25	10	25	9	40	8	20	9
1500	25	10	15	7	25	8	360	9
1600	20	11	30	8	20	9	360	8
1700	10	9	25	8	10	7	10	7
1800	15	10	20	7	10	7	360	7
1900	5	7	10	5	360	7	345	5
2000	350	6	355	4	350	6	315	3
2100	345	6	30	6	340	5	285	3
2200	330	6	15	4	345	4	300	3
2300	310	5	10	4	355	5	295	5

Time	W/D	W/S	W/D	W/S	W/D	W/S	W/D	W/S
	0705		0706		0707		0708	
0000	300	3	265	3	285	2	25	3
0100	295	2	260	3	280	2	340	3
0200	310	3	260	3	285	2	295	3
0300	295	2	255	3	280	2	285	4
0400	275	2	250	3	280	3	275	5
0500	280	3	255	4	280	4	290	2
0600	290	3	260	4	285	3	290	2
0700	325	5	265	4	285	3	290	2
0800	5	8	285	4	285	3	285	4
0900	5	9	360	7	310	4	240	2
1000	10	9	20	7	325	4	-	-
1100	15	9	40	8	10	5	-	-
1200	20	10	40	8	45	7	-	-
1300	15	8	45	8	45	7	-	-
1400	25	9	45	8	50	8	-	-
1500	20	8	40	7	50	9	-	-
1600	15	7	45	8	55	10	-	-
1700	360	5	40	8	55	8	-	-
1800	350	4	40	7	35	8	-	-
1900	360	3	35	5	25	7	-	-
2000	320	2	25	3	20	6	-	-
2100	310	2	360	3	40	4	-	-
2200	270	2	355	2	15	3	-	-
2300	265	2	310	2	55	5	-	-

Time	W/D	W/S	W/D	W/S	W/D	W/S	W/D	W/S
	0709		0710		0711		0712	
0000	-	-	-	-	340	2	45	2
0100	-	-	-	-	360	2	25	2
0200	-	-	-	-	315	2	40	5
0300	-	-	-	-	325	2	25	2
0400	-	-	-	-	300	2	345	2
0500	-	-	-	-	310	2	295	3
0600	-	-	-	-	295	2	310	3
0700	-	-	-	-	280	3	300	3
0800	-	-	-	-	295	3	305	3
0900	-	-	-	-	330	4	350	3
1000	-	-	-	-	20	5	40	3
1100	-	-	-	-	40	4	15	5
1200	-	-	-	-	35	7	60	6
1300	-	-	-	-	40	8	60	9
1400	-	-	-	-	40	9	40	7
1500	-	-	-	-	45	9	55	8
1600	-	-	-	-	50	8	50	9
1700	-	-	-	-	35	6	35	5
1800	-	-	-	-	35	4	315	2
1900	-	-	-	-	45	4	290	2
2000	-	-	-	-	55	4	295	2
2100	-	-	-	-	60	2	295	2
2200	-	-	-	-	55	2	275	2
2300	-	-	-	-	55	2	270	3

Time	W/D	W/S	W/D	W/S	W/D	W/S	W/D	W/S
	0713		0714		0715		0716	
0000	285	2	95	2	265	2	315	3
0100	290	2	100	2	270	2	310	4
0200	270	2	90	2	270	3	315	4
0300	285	2	60	2	300	2	300	4
0400	280	3	270	2	305	2	295	4
0500	270	3	270	2	300	2	290	5
0600	275	2	205	2	330	3	310	6
0700	285	3	255	2	300	3	315	6
0800	285	5	265	2	305	3	325	6
0900	285	4	275	3	350	5	345	8
1000	325	3	330	4	45	5	350	7
1100	25	4	45	6	50	7	360	8
1200	50	7	60	5	40	7	10	8
1300	60	7	60	7	45	6	5	8
1400	45	8	80	6	65	5	25	9
1500	40	8	85	6	65	7	30	8
1600	55	8	90	7	85	7	35	9
1700	40	7	90	4	60	8	30	10
1800	30	5	65	3	50	5	30	8
1900	25	4	65	3	25	3	5	6
2000	25	3	70	2	5	3	10	5
2100	50	2	70	2	315	3	360	4
2200	310	2	275	3	315	3	345	3
2300	90	2	270	3	320	3	315	3

Time	W/D	W/S	W/D	W/S	W/D	W/S	W/D	W/S
	0717		0718		0719		0720	
0000	305	4	295	3	270	4	290	3
0100	300	4	45	2	280	4	285	3
0200	295	4	330	2	270	3	275	2
0300	300	4	30	3	275	3	270	2
0400	310	4	300	3	270	3	275	2
0500	320	4	315	3	280	3	300	4
0600	315	5	305	3	290	5	320	5
0700	295	5	340	4	310	4	30	6
0800	315	5	80	4	290	5	40	8
0900	315	5	65	3	350	5	45	8
1000	340	8	45	4	25	4	40	7
1100	140	8	55	6	45	6	105	3
1200	35	9	50	7	55	8	90	6
1300	40	9	75	8	65	8	65	5
1400	40	10	60	7	60	7	65	5
1500	35	9	55	7	75	3	70	3
1600	20	9	55	6	100	2	75	2
1700	20	9	60	4	100	2	80	2
1800	15	8	60	3	100	2	20	2
1900	360	6	55	2	90	3	315	2
2000	25	5	50	2	85	2	310	2
2100	15	4	50	2	85	2	310	2
2200	360	3	325	2	15	3	310	2
2300	300	3	320	3	300	4	290	2

Time	W/D	W/S	W/D	W/S	W/D	W/S	W/D	W/S
	0721		0722		0723		0724	
0000	180	4	285	3	280	4	45	5
0100	110	2	295	2	285	4	40	4
0200	150	3	285	3	285	4	45	3
0300	270	2	285	3	280	3	25	2
0400	275	2	285	3	280	4	295	3
0500	270	3	290	3	285	5	295	3
0600	265	2	280	4	280	5	295	4
0700	330	4	305	5	295	3	300	4
0800	310	4	310	6	315	5	320	5
0900	110	3	20	6	340	6	360	8
1000	40	5	35	8	15	5	45	10
1100	40	7	40	7	50	7	45	12
1200	25	6	50	8	65	6	45	13
1300	30	4	45	7	45	8	50	13
1400	50	7	35	8	50	9	40	7
1500	50	8	360	5	45	9	20	7
1600	45	6	30	4	45	8	25	8
1700	15	4	100	4	40	7	40	10
1800	360	3	120	3	20	3	35	10
1900	50	5	120	2	20	3	35	9
2000	340	3	350	6	295	2	40	9
2100	325	3	275	5	280	2	40	8
2200	310	3	305	6	285	2	40	7
2300	290	3	280	7	350	4	40	10

Time	W/D	W/S	W/D	W/S	W/D	W/S	W/D	W/S
	0725		0726		0727		0728	
0000	20	5	15	4	-	-	305	4
0100	10	4	350	6	275	2	305	4
0200	40	7	330	4	270	2	290	3
0300	340	3	310	4	250	2	295	3
0400	350	3	295	3	250	2	285	4
0500	25	4	290	4	295	2	285	5
0600	310	4	340	4	180	3	310	4
0700	310	5	310	6	120	3	360	5
0800	335	6	360	7	80	4	350	5
0900	25	8	15	8	110	4	10	4
1000	50	10	20	9	100	5	345	4
1100	45	10	35	8	95	6	20	5
1200	45	11	40	9	90	5	40	7
1300	45	10	40	9	65	7	45	8
1400	45	10	40	9	55	7	55	9
1500	40	9	35	8	45	6	65	8
1600	30	9	-	-	40	5	70	6
1700	30	7	-	-	25	4	50	5
1800	40	8	-	-	10	4	60	5
1900	35	7	-	-	15	3	55	4
2000	25	5	-	-	20	3	60	3
2100	350	4	-	-	10	3	65	4
2200	330	3	-	-	360	2	70	4
2300	470	8	-	-	290	3	60	4

Time	W/D	W/S	W/D	W/S	W/D	W/S	W/D	W/S
	0729		0730		0731			
0000	55	4	10	2	255	2		
0100	50	4	335	4	270	2		
0200	45	3	30	2	270	2		
0300	45	3	30	2	270	2		
0400	45	2	45	3	270	2		
0500	55	3	20	2	290	2		
0600	50	2	295	3	295	2		
0700	5	2	285	3	295	2		
0800	325	3	295	3	315	3		
0900	300	3	30	3	350	4		
1000	30	4	80	4	35	5		
1100	40	6	90	5	50	6		
1200	45	7	85	5	60	6		
1300	50	8	90	5	65	7		
1400	50	7	105	5	70	7		
1500	50	8	85	5	60	7		
1600	45	9	60	4	85	5		
1700	45	8	45	4	70	6		
1800	40	5	25	3	60	5		
1900	35	4	315	3	30	4		
2000	40	4	290	3	40	2		
2100	25	3	275	5	50	2		
2200	45	2	280	3	45	4		
2300	45	2	280	2	285	4		